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New or otherwise interesting lichens from the tropics, including the lichen genus *Ramboldia* in Thailand

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Abstract — *Acanthothecis dialeucoides, Gassicurtia marbachii, G. nordinii, Kalbographa lueckingii, Malcolmiella duplomarginata, M. piae* and *Ramboldia siamensis* are described as new to science. Range extensions are reported for *Diorygma soozanum* (from Thailand) and *Ramboldia haematites* (from Taiwan). *Graphina reniformis* var. *subasteroidea* is an *Acanthothecis* species of uncertain specific allocation. A key for the identification of *Ramboldia* species in Thailand is presented.

Key words — *Graphidaceae, Lecanoraceae, Physciaceae, Pilocarpaceae*

Introduction

Interest in tropical lichens has increased significantly during the last decade, resulting in many new monographs and contributions to the tropical lichen biota [e.g. Aptroot et al. (2008, 2009), Archer (2007), Bungartz et al. (2007), Cáceres (2007), McCarthy (ed., 2009), Frisch & Kalb (2006), Galloway (2007), Kalb et al. (2004), Lücking (2008), Lücking & Caceres (2004), Marbach (2000), Moberg (2004), Rivas Plata et al. (2006), Sipman (2002)]. These (and many more) have extended our knowledge of lichenized fungi considerably. Nevertheless we are still far from having a complete inventory of these organisms occurring in tropical countries, and can only approach this goal step by step and this paper provides a further small step.

Materials and methods

Most of the material used for study is housed in the private herbarium of the senior author (KK), but specimens from herbaria such as B, G, H, M, RAMK and S were investigated for comparison. The lichens were examined with a

Wild M3Z Plan stereomicroscope and an Olympus BH-A research microscope. Sections were prepared using a freezing microtome Leitz Kryomat 1321 and mounted in tap water and lactophenol cottonblue. Photos were taken with a Nikon Coolpix 990 Digital-Camera adapted to one of the microscopes. Natural compounds were characterized by thin-layer chromatography (TLC) according to the methods standardized for lichen products (Culberson 1972, Elix & Ernst-Russell 1993), and by high-performance liquid chromatography (HPLC) (Elix et al. 2003).

Taxonomic descriptions

Acanthothecis dialeucoides Kalb & Staiger, **sp. nov.**

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Similis A. dialeucae, *sed ascosporis maioribus, cum solutione Lugol reagentibus et thallo acidum sticticum deficienti differt.*

Type: REPUBLIC OF SOUTH AFRICA. Mpumalanga: near Lydenburg; F. Wilms s.n., comm. G. Lahm (M – holotype). [The original label is in Latin and says: "Corticolam prope urbem Lydenburg in Republica Transvaalica Africae meridionalis, leg. Dr. F. Wilms. Comm. Dr. G. Lahm"].

Etymology: the epithet refers to the similarity with *Acanthothecis dialeuca.*

Thallus corticolous, whitish to cream-coloured, thin, smooth to cracked areolate. Ascocarps numerous, short, straight or bent, rarely branched, 0.5–1 × 0.2–0.3 mm. Exciple uncarbonised, poorly developed, pale orange at the base, laterally rudimentary. Hymenium c. 90 µm high, not inspersed. Paraphyses parallel or in the upper part of the hymenium rarely anastomosing, tips warty, hyaline or yellowish-brown. Periphysoids not seen. Ascospores 4–6/ascus, hyaline, muriform, 7–11 × 3–5-locular, 30–47 × 16–19 µm, I+ blue-violet.

Chemistry: no substances detectable by TLC.

Discussion: This lichen was identified as *Graphina socotrina* [sic!] by Müller [= *Acanthothecis socotrana* (Müll. Arg.) Staiger & Kalb 2002, as *A. socotrina*], but that species contains norstictic acid and the ascospores are I– and much narrower (10–15 µm in *A. socotrana* versus 16–19 µm in *A. dialeucoides*). The basionym for the *Acanthothecis* species from Socotra was *Diorygma socotranum* Müll. Arg. (Müller 1882a) and not *D. socotrinum* as cited by Staiger (2002). Therefore, the basionym orthography used in the original publication should be adopted, although Müller recombined the name later the same year using a variant orthography, *Graphina socotrina* (Müller 1982b).

Diorygma soozanum (Zahlbr.) M. Nakan. & Kashiw., Bull. Natl. Sci. Mus., Tokyo, B (Botany) 29(2): 86 (2003).

This lichen, originally described as a *Graphina* species, was recently transferred to *Diorygma* (Nakanishi et al. 2003) but not cited in Aptroot et al. 2007. Although

the chemistry of the Thai collections is more complex than mentioned in the monograph of the genus (Kalb et al. 2004), we have no doubt that they belong to this species. In addition to the major compound, norstictic acid, we found stictic, connorstictic and constictic acids as minor substances. The hymenium turns weakly blue at the lateral parts when treated with Lugol's solution, contrary to *D. junghuhnii* (Mont. & Bosch) Kalb et al, 2002, where the hymenium turns completely blue-violet. *Diorygma soozanum* is also similar to *D. tuberculosum* (Stirt.) Kalb et al. 2004, but in that species the ascospores are not or only weakly amyloid, while in *D. soozanum* they turn violet in Lugol's solution.

The collections cited below are new additions to the Thai lichen biota.

Specimens examined: **THAILAND.** Nakhon Rachasima province: Khao Yai National Park: in a very disturbed tropical rainforest near the students' lodges (Ban krong kaew), between 14°26'18"N, 101°22'24"E and 14°22'02"N, 101°24'25"E, 760 m 13.III.2008, K. Kalb (hb. Kalb 36998). Chiang Mai province: Mae Rim district; in a dry *Dipterocarpus* forest along a big pond called 'Huay Tueng Tao Reservoir', c. 6 km NNW of Chiang Mai. 18°52'11"N, 98°56'28"E, c. 360 m. 16.III.2008, K. Kalb, K. Buarueng & S. *Jariangprasert* (hb. Kalb 37125, RAMK). Foothills of Doi Suthep-Pui near Mae Rim, Queen Sirikit Botanic Garden, NE of Chiang Mai, in a dry, open *Dipterocarpus* forest, between 18°53'16"N, 98°51'47"E, 850 m and 18°54'33"N 98°51'17"E, 870 m. 18.III.2008, K. Kalb, K. Buarueng, S. Jariangprasert, W. Polyiam T. Pooprang & W. Saipunkaew (hb. Kalb 336930, RAMK). Medicinal garden, in a ± open *Cinchona* plantation near Doi Suthep-Pui National Park, ENE of Chiang Mai, 18°48'22"N, 98°54'53"E, 1085 m. 17.III.2008, K. Kalb, K. Buarueng, S. Jariangprasert & W. Saipunkaew (hb. Kalb 36935). Doi Suthep-Pui National Park, ENE of Chiang Mai; trail to Monthanthan waterfall, in a humid *Dipterocarpus* forest, 18°49'00"N, 98°55'28"E, 700 m. 17.III.2008, K. Kalb, K. Buarueng, S. Jariangprasert & W. Saipunkaew (hb. Kalb 37066).

Gassicurtia marbachii Kalb & Elix, **sp. nov.** Figs. 1, 2

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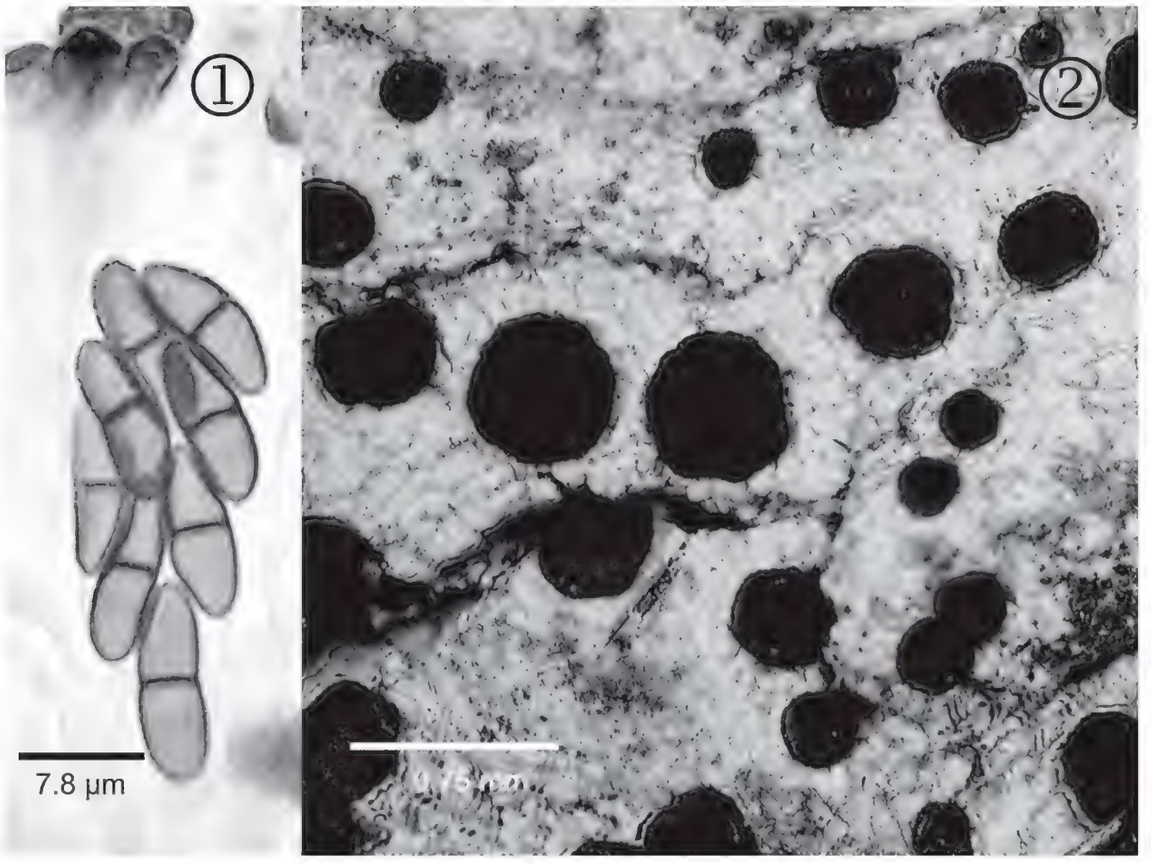
Similis G. vaccinii, *sed ascosporis minoribus et acidum secalonicum X (maxime), 2,7-dichloronorlichexanthonum (minus), atranorinum (minus) et acidum chiodectonicum (minime) continens differt.*

Type: **KENYA.** Coast Province: Kwale District, Shimba Hills, in a tropical rainforest, 350 m. 1.–2.IX.1985, K. Kalb & A. Schrögl 13115 (hb. Kalb – **holotype**).

Etymology: the epithet honours the Austrian lichenologist Dr. Bernhard Marbach, who made considerable contributions to our knowledge of the systematics of corticolous *Buellia* species sensu lato and who resurrected Fée's genus *Gassicurtia*.

Thallus corticolous, white, 50–70 µm thick, continuous, uneven to bullate, filled with many hyaline crystals. Phenocortex 5–10 µm thick, algal layer not distinctly separated, c. 10 µm thick, Algal cells chlorococcoid, 10–13 µm in diam. Ascocarps numerous, sessile, 0.3–0.6 mm diam., disc black, epruinose, with an inconspicuous, black proper margin, sometimes with a trace of purple due to chiodectonic acid, especially in the lower part, 0.02–0.03 mm thick, slightly prominent. Excipulum laterally 30–50 µm thick, outer part dark

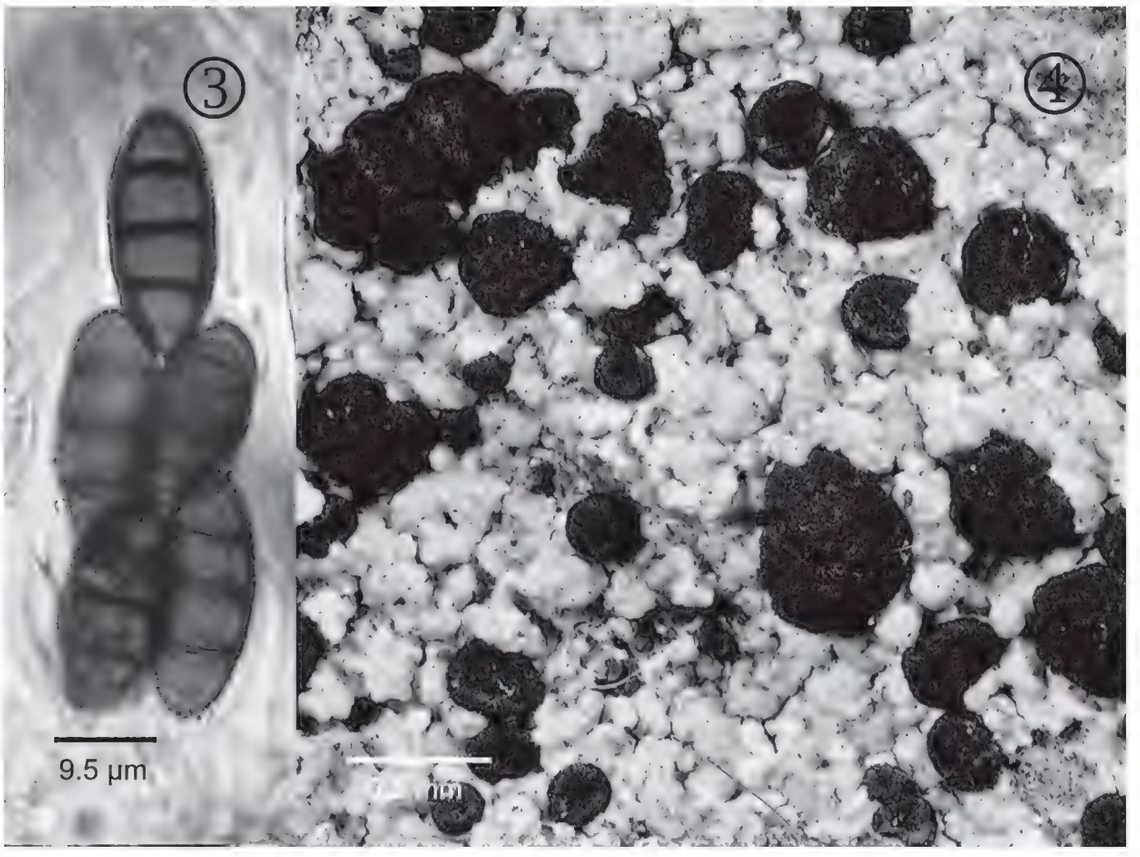


Figures 1–2. *Gassicurtia marbachii* (K. Kalb & A. Schrögl 13115).
1. Part of the hymenium with ascus and ascospores; 2. Part of the holotype.

brown to black, filled with crystals of chiodectonic acid, inner part brown. Hypothecium 80–120 µm high, dark brown. Hymenium 70–90 µm high, hyaline, not inspersed. Paraphyses simple, 1.5–2 µm thick, apically furcate, up to 5 µm thick with a brown cap. Ascospores (6–)8/ascus, olive brown to chocolate brown, 1-septate, 10–11 × 3–4(–5) µm.

Chemistry: secalonic acid X (major), 2,7-dichloronorlichexanthone, atranorin (both minor) and chiodectonic acid (trace). – HPLC, TLC by J.A. Elix.

Discussion: Previously only two corticolous *Gassicurtia* species were known to contain secalonic acid derivatives, namely *G. coccinea* Fée 1825 (unknown secalonic acids) and *G. coccinoides* Marbach 2000 (secalonic acid X2). However, both differ in their major metabolites namely, thiophaninic acid in the former and boryquinone in the latter. *G. marbachii* contains 2,7-dichloronorliche xanthone, which is the first report of this xanthone in the genus *Gassicurtia*. *G. vaccinii* (Vain.) Marbach et al. (Marbach 2000) seems most closely related, but also differs in its chemistry (thiophanic acid and 3-*O*-methylthiophanic acid as major metabolites and arthothelin as a minor compound). Furthermore, that species has larger ascospores (15–16 × 5.5–6.5 µm) and lacks chiodectonic acid in the lateral exciple.



Figures 3–4. *Gassicurtia nordinii* (K. & A. Kalb 26149).
1. Part of the hymenium with ascus and ascospores (three ascospores missing);
2. Part of the holotype.

Gassicurtia nordinii Kalb & Elix, **sp. nov.** Figs. 3, 4

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Similis G. catasemae, *sed ascosporis maioribus, triseptatis, et thallo 2-chlorolichexanthonum continenti differt.*

Type: **MASCARENE ISLANDS:** Réunion. Between le Brûlé (S of St-Denis) and Plaine des Cnicots, in a tropical rainforest with *Nastus borbonicus, Acacia heterophylla, Cyathea borbonica, Philippia montana,* etc., 20°57S, 55°27'E, 1500 m. 15.VIII.1991, K. & A. Kalb 26149 (hb Kalb – **holotype**).

Etymology: the epithet honours the Swedish lichenologist Dr. Anders Nordin for his significant contributions to our knowledge of *Buellia* species with pluriseptate ascospores.

Thallus corticolous, whitish to cream-coloured, 100–200 µm thick, cracked areolate or bullate, partly subfoliose and ascending. Phenocortex 15–20 µm thick, algal layer not distinctly separated, up to 160 µm thick, Algal cells chlorococcoid, 10–13 µm in diam. Ascocarps numerous, sessile, 0.3–0.6 mm diam., disc black, epruinose, with an inconspicuous, black proper margin, 0.02–0.03 mm thick, not prominent. Excipulum laterally 30–50 µm thick, outer part dark brown to black, inner part brown. Hypothecium 80–120 µm high, dark brown. Hymenium 70–90 µm high, hyaline, not inspersed. Paraphyses simple, 1.5–2 µm thick, apically furcate, up to 5 µm thick with a brown cap.

Ascospores (6–)8/ascus, olive brown to chocolate brown, 3-septate, 17–23 × 7–9 µm.

Chemistry: barbatic acid (major), chiodectonic acid, 2-chlorolichexanthone (both minor). – HPLC, TLC by J.A. Elix.

Additional material studied: **MASCARENE ISLANDS:** Réunion. Just below the summit of Piton Maïdo, in a shrubbery composed of *Acacia heterophylla, Philippia montana, Hypericum lanceolatum*, 21°03'S, 55°23'E, 2200 m. 30.VIII.1991, K. & A. Kalb 26376 (hb. Kalb).

Discussion: At present only two corticolous *Gassicurtia* species are known to contain barbatic acid as a major metabolite, namely *G. catasema* (Tuck.) Marbach 2000 and *G. elizae* (Tuck.) Marbach 2000. Both contain obtusatic acid as a minor substance and the former additional lichexanthone (Kalb & Elix 1998). *Gassicurtia nordinii,* however, contains 2-chlorolichexanthone and chiodectonic acid as minor substances. In addition, the new species is readily separated from all the other corticolous species of *Gassicurtia* by its 3-septate ascospores. In the general description of the genus, Marbach (2000) stated that the ascospores may be 1- or 3-septate, but all the species mentioned had only 1-septate ascospores.

Graphina reniformis var. ***subasteroidea*** Redinger, Ark. Bot. 26 A(1): 69 (1933).

Type: **BRAZIL.** Mato Grosso: Serra da Chapada, Buriti. VI.1894, Malme 3520 (S-holotype!).

This material belongs in *Acanthothecis*, but a detailed examination located no ascospores and the chemistry alone, protocetraric acid, makes it impossible to assign this specimen to a particular species. Therefore, we regard the name as a 'nomen dubium'.

Three species of *Acanthothecis* from Brazil are known to contain protocetraric acid, namely *A. clavulifera* with trans-septate ascospores and *A. abaphoides* and *A. hololeucoides* with muriform ascospores. While *A. clavulifera* seems to be rare in Brazil, the latter two species are quite common.

Kalbographa lueckingii Kalb, **sp. nov.** Figs. 5, 6

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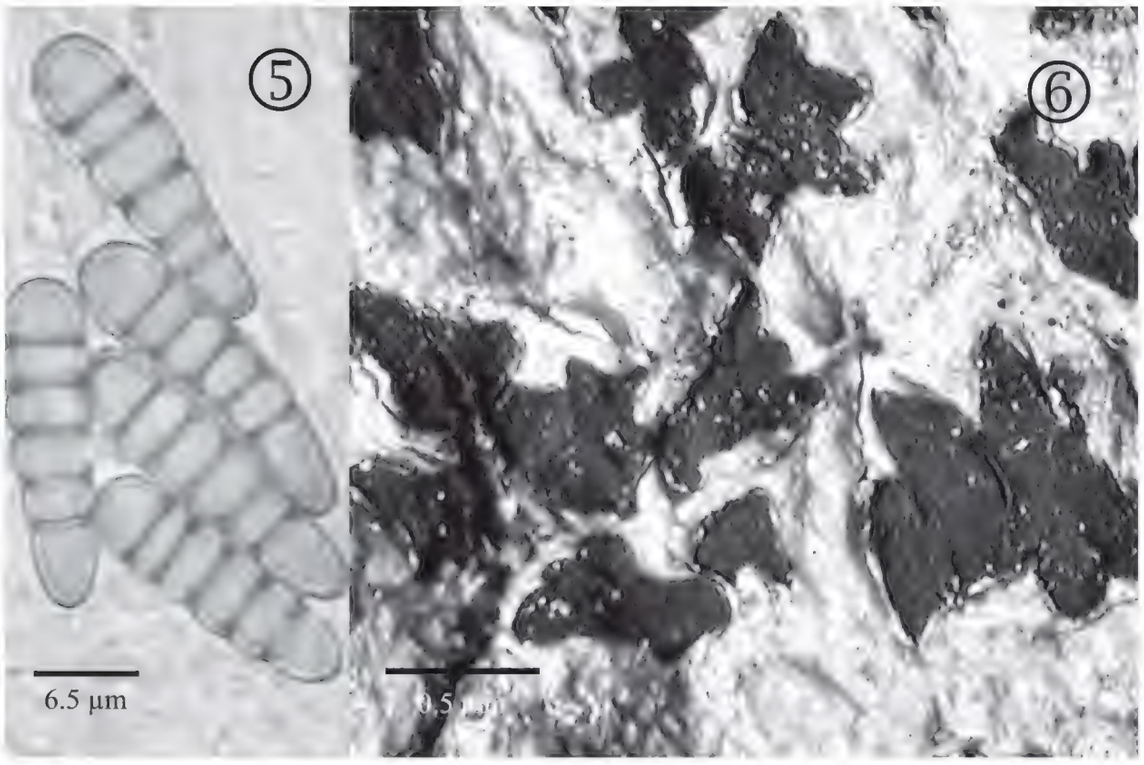
Similis Kalbographae lobatae, *sed hymenio insperso, ascosporis solum transversaliter septatis et thallo acidum norsticticum continenti differt.*

Type: **HISPANIOLA.** Dominican Republic: La Vega; Trail from Jarabacoa to Salto Baiguate, c. 5 km S of Jarabacoa, on a free standing deciduous tree, 530 m. 19°04'N, 70°27'W, 17.VIII.1996, leg. K. Kalb 33152 (hb. Kalb – **holotype**)

Etymology: The new species is dedicated to my friend and colleague, Dr. Robert Lücking, for his outstanding contributions to tropical lichens.



Figures 5–6. *Kalbographa lueckingii* (K. Kalb 33152).
1. Part of the hymenium with ascospores; 2. Part of the holotype.

Thallus crustose, corticolous, continuous, 100–120 µm thick, smooth, whitish, phenocortex cartilaginous, 10–15 mm thick, algal layer 60–80 µm thick, with clusters of large calcium oxalate crystals, medulla indistinct, c. 10–30 µm thick, soralia and isidia absent. Photobiont *Trentepohlia*. Apothecia emerged to erumpent, angled to round or elongated, 0.4–1.2 × 0.2–0.3 mm, often some lirellae confluent and forming star-like aggregations; disc plane to slightly concave, dark brown to black, wide open, proper exciple indistinct or very thin, thalline margin indistinct or very thin. Exciple in section c. 10 µm thick, brown, laterally and at the base bordered by thallus with clumps of large calcium oxalate crystals. Subhymenium 10–15 µm high, hyaline; hypothecium 10–20 µm high, brown, K–. Epihymenium brownish, c. 10 µm high. Hymenium 40–60 µm high, hyaline, inspersed. Asci clavate, 40–50 × 10–12 µm. Ascospores brown, 8/ascus, with 5(–6) trans-septa, elongate ellipsoid, 18–23 × 6–7 µm, not halonate, I– (when young as well as mature). Pycnidia not observed.

Chemistry: Norstictic acid (major) connorstictic acid (minor).

Discussion: With the description of this new species the generic concept of the recently established genus (Lücking 2007) must be expanded. Previously all three known species have submuriform ascospores, a clear hymenium and no secondary lichen products in the thallus. But there are many other genera in the *Graphidaceae* (e.g. *Graphis, Phaeographis, Platythecium, Thelotrema*)

that contain species with and without an inspersed hymenium, with all types of ascospore septation, and with or without norstictic acid. Furthermore, the young, still hyaline, ascospores show no reaction with Lugol's solution. All these characters place the species very close to *Phaeographis*. However, in the phylogenetic tree presented by Staiger et al. (2006) (there named ?*Phaeographis* sp. BS5), *Kalbographa lueckingii* does not cluster within the monophyletic *Phaeographis* clade.

Malcolmiella duplomarginata Papong & Kalb, **sp. nov.** FIG. 7

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Similis Malcolmiellae graniferae, *sed apotheciis excipulo thallino circumdatis et ascosporis maioribus differt.*

TYPE: **THAILAND**. KANCHANABURI PROVINCE: Sai Yok District; Sai Yok National Park, in a dry evergreen forest, 35 m. 14°43'N, 98°85'E, 12.III.2009, K. Papong, 6557 (MSUT – **holotype**).

THALLUS crustose, corticolous, continuous, 50–80 µm thick, densely verrucose, green to green-grey, phenocortex c. 10–15 µm thick, with many small crystals, algal layer 30–55 µm thick, medulla indistinct, c. 10 µm thick, prothallus whitish, soralia and isidia absent. Verrucae 0.1–0.4 mm high and 0.1–0.3 mm wide. Medulla of verrucae and thallus cream to white, K+ orange. Photobiont chlorococcoid, cells 7–11 µm diam. APOTHECIA sessile, round, 0.7–1.5 mm diam. and 0.4–0.6 mm high; disc plane to slightly concave, bay-coloured; margin of *granifera*-type, thick, slightly prominent, white to cream coloured, surrounded by a continuous or granular layer of thalline exciple. THALLINE EXCIPLE c. 50 µm thick, densely filled with algal cells; PROPER EXCIPLE hyaline, with an internal medullary layer composed of loosely arranged, periclinal hyphae with constricted septa, 70–100 µm wide, incrusted with whitish to creamy hydrophobic granules, nebulous but dissolving in KOH to give a K+ lemon yellow to greenish yellow reaction. SUBHYMENIUM c. 25 µm high, brown; HYPOTHECIUM 40–60 µm high, blackish brown, K–. EPIHYMENIUM brownish. HYMENIUM 100–130 µm high, hyaline. ASCI 90–110 µm × 18–22 µm. ASCOSPORES 4–8/ascus, non-septate, wall equally thickened, halonate, ellipsoid, 20–24 × 11–15 µm, halo 2–3 µm thick. PYCNIDIA not observed.

CHEMISTRY: Atranorin (major), unknown eumitrin derivatives (minor).

ADDITIONAL SPECIMEN STUDIED: **THAILAND**. SAKON NAKHON PROVINCE: Phu Pan National Park, next to the repeated Television signal 5 Center, in a dry dipterocarp forest, 17°03 N, 103°58'E, 327 m. 9.IV.2009, K. Papong 6562 (MSUT).

DISCUSSION: The new species is quite remarkable and distinctive because of its thalline exciple surrounding the medullary exciple. This character is unique and not seen in any other species of the genus. Furthermore, only a few species (as yet unpublished) are known with ascospores larger than 20 µm.

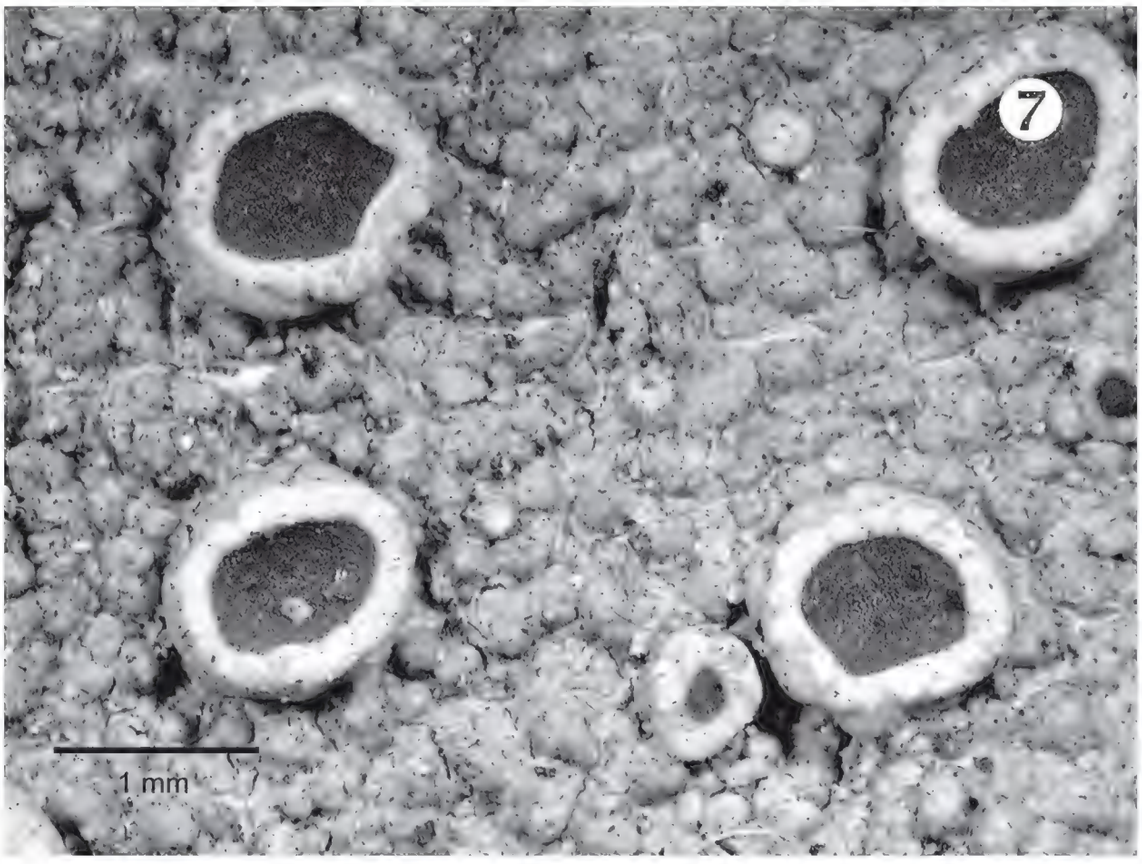

FIGURE 7. *Malcolmiella duplomarginata* (K. Papong, 6557); part of the holotype.

Malcolmiella piae Kalb, **sp. nov.** FIG. 8

MYCOBANK MB 514192

Similis Malcolmiellae graniferae, *sed thallo crassiore, verrucis coralloideis et ascosporis maioribus differt.*

TYPE: **THAILAND.** CHIANG MAI PROVINCE: foothills of Doi Suthep-Pui near Mae Rim, Queen Sirikit Botanic Garden NE of Chiang Mai, 18.III.2008, in a dry *Dipterocarpus* forest, 860 m. 18°54'33"N, 98°51'17"E, K. Kalb 36845 & S. Jariangprasert (RAMK – **holotype**, hb Kalb – isotype).

ETYMOLOGY: This new species is named in honour of Mrs S. Jariangprasert, called Pia, who was an expert guide during the senior author's (K. K.) visit to Chiang Mai and who showed this lichen to him in the field.

THALLUS corticolous, crustose, continuous, 50–80 µm thick, yellowish green to green-grey, densely verrucose, phenocortex c. 5–10 µm thick, with many small crystals, algal layer 20–40 µm thick, medulla indistinct, c. 20–30 µm thick, prothallus whitish, true soralia and isidia absent. Verrucae initially 0.1–0.2 mm wide and 0.2–0.3 mm high, becoming confluent with age and forming rather large and conspicuous coralloid clumps (to 0.5 mm wide and 0.6 mm high). Verrucae remaining closed or becoming erumpent at the apices and producing soredia-like corticate granules and exposing the medulla. Medulla of verrucae and thallus lemon yellow, K+ orange. Photobiont chlorococcoid, cells 7–11

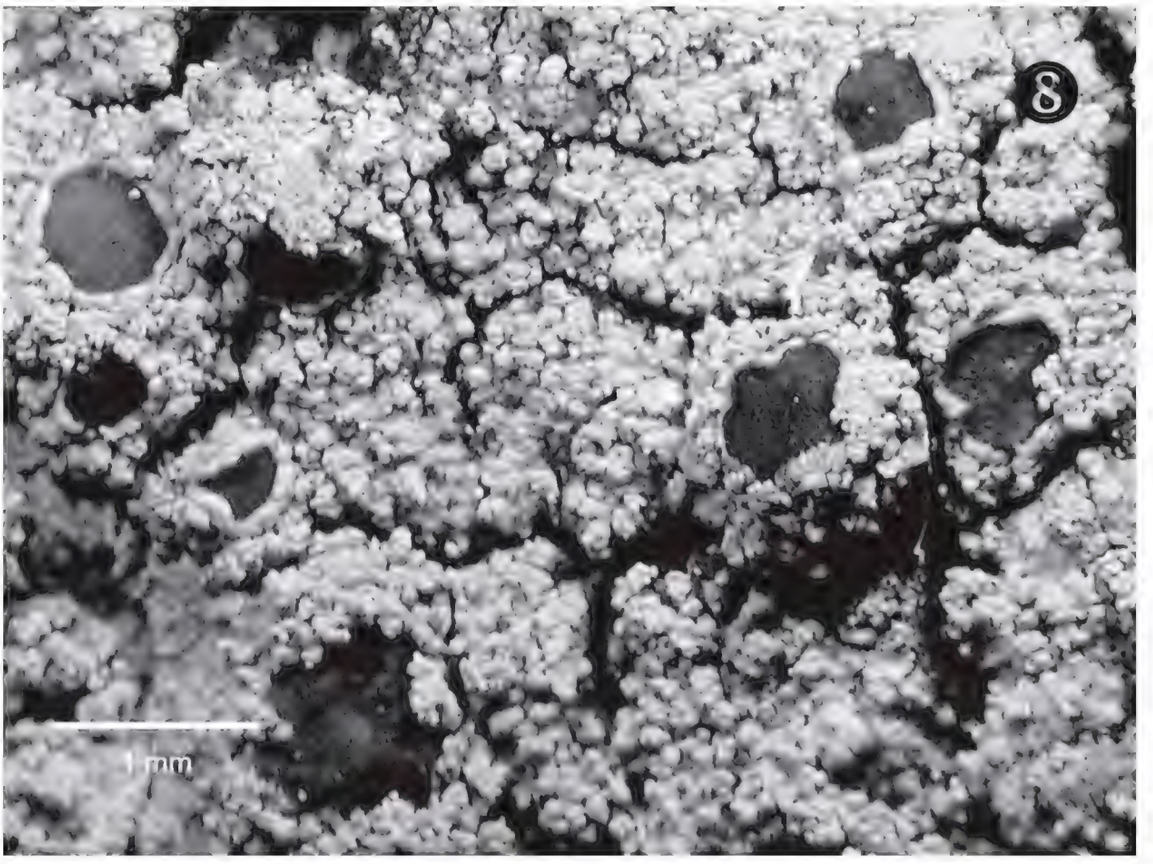

Figure 8. *Malcolmiella piae* (K. Kalb 36845); part of the Holotype.

µm diam. Apothecia sessile, round, 0.7–1.5 mm diam. and 0.4–0.7 mm high; disc plane to slightly convex, bay-coloured; margin of *granifera*-type, thick, entire, slightly prominent, white to cream coloured. Exciple hyaline externally, with a medullary layer composed of loosely arranged, periclinal hyphae with constricted septa; the inner parts adjacent to hypothecium dark brown, 75–150 µm wide; hyaline parts incrusted with whitish to creamy hydrophobic granules, nebulous but dissolving in KOH to give a K+ lemon yellow to greenish yellow reaction. Subhymenium c. 25 µm high, brown; hypothecium 60–150 µm high, blackish brown, K–. Epihymenium brownish. Hymenium 150–200 µm high, hyaline. Asci 80–100 µm × 18–22 µm. Ascospores (2–)4–8/ascus, non-septate, wall equally thickened, halonate, ellipsoid, 16–22 × 9–12 µm, halo 1–2 µm thick. Pycnidia not observed.

Chemistry: Atranorin (major), eumitrin F, (major), eumitrin D (minor), usnic acid (trace), unknown cf. contortin (anal. J. Elix, TLC, HPLC).

Additional specimen studied: **Thailand**. Chiang Mai Province: Mae Rim district; in a dry *Dipterocarpus* forest along a big pond called "Huay Tueng Tao Reservoir", c. 6 km NNW from Chiang Mai, 360 m. 18°52'11"N, 98°56'28'E, K. Kalb, K. Buarueng, & S. Jariangprasert (hb. Kalb 37054). – **Australia**. Northern Territory: Kakadu National Park, "Gungarre Monsoon Forest" near South Alligator, 75 m. 12°41'S, 132°29'E, K. & A. Kalb (hb. Kalb 30436, 35171).

Discussion: The development of the verrucae is very similar to those in *Dirinaria aegialita* (Afzel. ex Ach.) B.J. Moore 1968 or *Pyxine coralligera* Malme 1897, most accurately described by Swinscow & Krog (1978). The new species is similar to *Malcolmiella granifera* (Ach.) Kalb & Lücking 2000, but in this species the verrucae never become coralloid and the ascospores are significantly smaller (10–15 × 6–9 µm). Sterile thalli of *M. piae* also resemble warted or papillose populations of *Megalospora sulphurata* Meyen 1843, but they are readily separated by their alternative chemistry (usnic acid and zeorin in the latter). Cochromatography of the Australian collections with the holotype revealed an identical array of (mostly unknown) eumitrin derivatives.

Ramboldia russula (Ach.) Kalb, Lumbsch & Elix, Nova Hedwigia 86(1–2): 37 (2008).

This species was mentioned in Wolseley et al. (2002), but at that time it was not distinguished from *R. haematites* (Fée) Kalb et al. 2008, which also has a pantropical distribution. As yet we have not found the latter species in Thailand. The two species can readily be separated by their chemistry, i.e. fumarprotocetraric acid (major), lichexanthone (major to trace or not detectable by TLC), russulone, norrussulone and secalonic acid A in *R. russula* and lichexanthone (major–minor), norstictic acid (major), connorstictic acid (major–minor) and russulone in *R. haematites*.

Specimens studied: **THAILAND**. Chiang Mai Province: Queen Sirikit Botanic Garden, on unidentified tree, 700 m. in a dry dipterocarp forest, W. Khamthim, 3.III.1998 (RAMK 2949); on *Holigarna kurzii*, K. Boonpragob, 17.I.1995 (RAMK 2945); 18°48'22"N, 98°54'53"E, 1085 m. K. Kalb et al. 17.III.2008 (hb. Kalb 36936, RAMK); Lumphun, Mae On, ESE of Chiang Mai, descent from Doi Mon Larn to Mae Kam Pong village, in an evergreen mountain forest dominated by *Lithocarpus, Quercus* and *Castanopsis*, c. 18°51'22"N, 99°22'02"E, c. 1500 m. 19.III.2008, K. Kalb, K. Buarueng, W. Polyiam & W. Saipunkaew. (hb. Kalb 36914, RAMK). Medicinal garden, in a ± open *Cinchona* plantation near Doi Suthep-Pui National Park, ENE of Chiang Mai, 18°48'22"N, 98°54'53"E, 1085 m. 17.III.2008, K. Kalb, S. Jariangprasert, K. Buarueng & W. Saipunkaew (hb. Kalb 36774*); Phitsanulok province: Phu Hin Rong Kla National Park, Lan Hin Tak, on *Quercus austrocochinchinensis* in lower montane scrub, 17°00'16"N, 100°56'57"E, 935 m. 3.II.2003, N. Homchantara (RAMK 2944*); same locality, Lan Hin Pum, on *Rhododendron* spec., 1175 m. 3.VI.2003, C. Thunyagun (RAMK 2951*).

Comments: In the collections marked with an asterisk, lichexanthone could not be detected by means of TLC. As we could not find any anatomical or morphological differences in the specimens with this xanthone, we consider it of no taxonomic consequence. Interestingly, in one collection (RAMK 2951) the UV- and the UV+ forms are growing close together on the same piece of bark, separated from one another by a dark prothalline line. More material and molecular genetic studies are necessary to resolve this problem.

Ramboldia siamensis Buaruang, Elix & Kalb, **sp. nov.** FIG. 9

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Similis R. heterocarpae, *sed colore thalli et materia chemica differt.*

TYPE: **THAILAND.** PHITSANULOK PROVINCE: Phu Hin Rong Kla National Park, Lan Hin Taek, on sandstone (siliceous rocks), 980 m in lower montane scrub, 17°00'27"N, 100°59'36"E, C. Phraphuchamnong, K. Papong and J. Sutjaritturakan, 27.VII.2002 (RAMK 2934 – **holotype**, RAMK 2937 – isotype). Chemistry: Fumarprotocetraric acid (major), lichexanthone (major), parietin (minor), emodin (minor), chrysophanol (minor), russulone, norrussulone, unknown sekalonic acid (anal. J. Elix, TLC, HPLC).

ETYMOLOGY: The specific name is derived from Siam, the historic name for Thailand.

THALLUS usually saxicolous, rarely corticolous, crustose, superficial, creamy white, creamy grey or pale ochre, sometimes with orange dots at the edges of areoles, continuous, areolate to bullate, 0.2–0.4 mm thick; areoles irregularly shaped to angular, 0.2–0.7 mm wide, upper surface smooth to rough, lacking soredia and isidia. Prothallus not apparent. Cortex 30–50 µm thick, lacking an epinecral layer; medulla white, but orange in part; algal layer c. 30–50 µm thick; algal cells 6–9 µm wide. APOTHECIA common, dispersed to crowded, sessile, 0.5–1.3 mm wide, convex to ± flat, round to irregular in shape, dark red or red-brown, shiny, epruinose. TRUE EXCIPLE concolorous with the disc, thin, persistent or excluded with age; EPITHECIUM red or orange-red, inspersed with fine reddish granules, K+ reddish purple; HYMENIUM colourless, I+ blue, 100–120 µm tall; HYPOTHECIUM deep orange-red, 100 µm thick; PARAPHYSES strongly conglutinated, mostly simple; apices not conspicuously swollen, 2–3 µm wide. ASCI 8-spored, broadly clavate, c. 40 × 10 µm. ASCOSPORES 8/ascus, elongate-ellipsoid, colourless, smooth, lacking a distinct perispore, 9–11 × 3.0–3.5 µm. PYCNIDIA visible as black dots, immersed; conidia filiform, curved, 20–25 × 1 µm.

CHEMISTRY: Fumarprotocetraric acid (major), lichexanthone (major to trace), parietin (minor), emodin (minor), chrysophanol (minor), unknown sekalonic acid derivative (trace), russulone, norrussulone.

ADDITIONAL SPECIMENS EXAMINED: **THAILAND.** PHITSANULOK PROVINCE: Phu Hin Rong Kla National Park, Lan Hin Taek, on sandstone (siliceous rocks), in lower montane scrub, 17°00'27"N, 100°59'36"E, 1010 m. C. Phraphuchamnong, K. Papong & J. Sutjaritturakan, 27.VII.2002 (RAMK 2938, 2931, 2941), same locality, K. Buaruang, C. Phraphuchamnong & N. Homchantara, 6.II.2003 (RAMK 2942); Phitsanulok: Phu Hin Rong Kla National Park, view point of Lan Hin Taek, on sandstone (siliceous rocks) in lower montane scrub, 17°00'27"N, 100°59'36"E, 1010 m. C. Phraphuchamnong, K. Papong & J. Sutjaritturakan, 27.VII.2002 (RAMK 2930); Phitsanulok: Phu Hin Rong Kla National Park, 500 m right hand side of the multipurpose court, on sandstone and conglomeratic sandstone, 17°00'27"N, 100°59'36"E, 1010 m. C. Phraphuchamnong, 10.V.2003 (RAMK 2935, 2936); same locality, along the way to the state office, on sandstone (siliceous rock) in lower montane scrub, 17°00'27"N, 100°59'36"E, 1180 m. C. Phraphuchamnong, 8.V.2003 (RAMK 2932, 2933); LOEI PROVINCE: Phu Loung wildlife sanctuary behind a sign of Phu Loung wildlife sanctuary, on sandstone (siliceous rock), in lower montane scrub, C. Phraphuchamnong, 29.VIII.2005 (RAMK 2940); same

FIGURE 9. *Ramboldia siamensis* (RAMK 2934); part of the holotype.

locality, Phu Suan Sai, Toko, on *Castanopsis*, 1260 m. W. Khanthim, 12.VII.1995 (RAMK 2946*) – NAKHON RATCHASIMA PROVINCE: Khao Yai National Park, Khao Khaeo, on unidentified tree in a submontane evergreen forest, W. Polyiam, 12.III.2000 (RAMK 2947*).

COMMENTS: The collections, marked with an asterisk, are corticolous and show similar chemistry to the type except that lichexanthone was not detected by TLC.

Previously, only two species of *Ramboldia* were known from Thailand with certainty; however we have added *R. haematites* to the key, as it might be expected to occur here. Two collections from Taiwan cited below represent a new addition to the lichen biota of that country (Kalb et al. 2008, Aptroot & Sparrius 2003, reported as *Pyrrhospora russula*). Both specimens exhibited the same chemistry, i.e. lichexanthone (minor), norstictic acid (major), secalonic acid A (minor), russulone (trace), connorstictic acid (trace). – HPLC, TLC by J.A. Elix.

TAIWAN. NANTOU COUNTY: 44 km WNW of Hualien, Meifeng, 51RUG146655, 2050 m. on *Michelia formosana* in broadleaf forest remnant in valley, Aptroot 52284 (ABL). – TAICHUNG COUNTY: 30 km ENE of Taichung, 7 km NW of Kukwan, along mountain trail, 51RTG9279, 1000–1300 m. on *Shiia* branches, Aptroot 53455 (ABL).

Key to *Ramboldia* species in Thailand

1a. Medulla of thallus with orange or orange-red dots, K+ violet, parietin and emodin present; usually saxicolous ..... ***Ramboldia siamensis***

1b. Medulla of thallus white throughout, K+ yellow-brown to brown, fumarprotocetraric acid present; usually corticolous **2**

2a. Cortex of thallus K+ yellow turning red, norstictic acid present ..... ***Ramboldia haematites***

2b. Cortex of thallus K– ..... ***Ramboldia russula***

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